

Orton, A.; Frobisher, L.:

### **Insights into Teaching Mathematics**

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(Introduction to Education)

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This book is one of a series that offers to student teachers “a comprehensive analysis and evaluation of educational theory and practice in the light of recent developments”, these developments being identified as having taken place in the 1980s and 1990s, presumably with reference to UK. This particular book aims to “provide a brief introduction to many of the essential issues relating to the teaching of mathematics”. It is claimed that it should also provide valuable background information and guidance for all who teach mathematics across the primary and middle years of schooling. It sets out to deal with “not only all the main contemporary issues relating to mathematics teaching, but also provides practical advice and assistance for teaching all the main strands into which the mathematics curriculum is often divided”. It also claims to give direct teaching advice from the standpoint of relevant research findings concerning how pupils learn and the difficulties they seem to encounter.

The book, therefore, needs to be evaluated mainly in terms of how useful it will be to any intending teacher, since, at present, all teachers of children in the primary years, at least, are expected to teach mathematics, whether or not they have any particular interest in or aptitude for it, beyond the requirement of a GCSE pass in mathematics, and to what extent it meets the task the authors have set themselves. It should also be compared with other books that address the same market.

So what does the student teacher want (or need) to know? What is an appropriate balance of theory and practice? This book adopts a roughly half-and-half approach. The first six chapters are concerned with the mathematics curriculum, problems and investigations, an investigative approach to learning, language and mathematics and representation and symbolism. Four of the remaining five chapters deal with the teaching of specific content.

Chapter I contains a critical discussion of the reasons for

the perceived importance of mathematics in the school curriculum, the cultural heritage argument being the one that is most forcefully put. The section on attainment largely ignores recent work on international comparisons, and that on the national curriculum contains a very brief and largely uncritical review of the history of the introduction of the National Curriculum in England and Wales for schools (other than independent schools).

Chapter 2, Learning Mathematics, introduces the reader briefly to the work of Richard Skemp and to constructivism and makes several references to the Cockcroft Report (1982). As a chapter on learning mathematics, it is too brief and too trivial to provide an adequate foundation for today’s intending teachers. The next two chapters 3 and 4 provide arguments for and examples of the use of “problems and investigations” in the teaching of mathematics. Again, the historical background is traced briefly through Polya, the Association of Teachers in Colleges and Departments of Education, the Nuffield Mathematics Project, NCTM, and the Cockcroft report. The authors discuss the distinction between “problems”, “investigations” and “an investigative approach to learning”. We read “if an activity does not have a specific and recognizable goal, then perhaps it is an investigation, not a problem”. But problems are also sometimes described as “open”, sometimes “open-ended”, and sometimes “process problems”, so the definition continues: “Thus an open problem is another name for an investigation, whilst an open-ended problem is a process problem which gives rise to further problems”. The difficulty in writing *about* such matters is that it has all to be done in a descriptive manner, and one yearns for the opportunity to get the student teachers actively engaged in a variety of mathematical tasks and then to get *them* to describe what their processes of thinking and learning have been. Chapter 4 contains a somewhat cynical view of how teachers view mathematical activity: “Some teachers view mathematics as an exploration into the unknown world of symbols and are convinced that school mathematics, through its study of mathematical knowledge and skills, is a preparation for this world, not part of it. Such teachers do not recognize investigations as having a place in children’s experience of mathematics until they become university students, and then only perhaps at the postgraduate level. To other teachers, mathematics comprises only knowledge and skills and the purpose of school mathematics is to transmit these ideas to children”. One wonders what is the reason for the inclusion of such a pessimistic

view of mathematics teachers? The picture does not reflect the majority of teachers who I meet, and, even if accurate, it is difficult to see how it will help or inspire the student teachers, who are, after all, the intended readers, to be innovative when they arrive in school. Indeed, there is a somewhat patronising attitude to teachers, in statements such as: “There are many teachers . . . who are willing to discuss what an investigation might be and to consider how using an investigation with children might differ from what they are accustomed to teaching. For these teachers a step-by-step introduction of investigations into their classrooms may be the way forward”. All this seems designed to set up a false, and possibly subversive, barrier between teachers new to the profession and a collection of “die-hards”. The chapter continues with examples of a range of investigative tasks with discussion of the ideas involved. Also valuable for student teachers are the references to sources of such activities.

The role of language in mathematics is the subject matter of Chapter 5 and its nine pages raise the important issues of the use of informal language (like the use of the word “times”, as a verb) and of the way in which mathematics adopts words in common use but gives very specific meanings to them. In recent years, children have all too often been expected to learn mathematics from the written word, and, accordingly, issues of readability of mathematics texts are briefly discussed, as is the need for discussion between pupils themselves and between pupils and teachers.

Chapter 6 deals with the use of symbols in mathematics and Chapter 7 with working through a topic or theme, although it is strange that the one primary mathematics programme currently available in UK that works through a thematic approach is not mentioned.

In Chapters 8 to 11, some of the important research relating to the teaching of Number, Algebra, Shape and Space and Data Handling is described and clearly referenced. The complaint is often heard that the results of research do not get communicated to teachers and so do not have an appropriate effect on teaching styles. The authors perform a very useful service, in this section, in explaining, with clear diagrams, research that relates to the primary years. There is a very large amount of research from which the authors could have made their selection, and, no doubt, some would question the choice and would have wished to see other results included. But the selection here will surely be found helpful to teachers and will be a very helpful resource to both intending and practising teachers.

The final chapter concerns the assessment of mathematical attainment and takes a very “politically correct” response to recent events in UK, an approach that many might find over enthusiastic. There is certainly no hint of the arbitrariness, not only of the form of the national curriculum in mathematics, but also of the principle of national testing at ages 7, 11 and 14, in addition to the existing public examination at 16. Nor is there any discussion of the possible detrimental effects of the use of “league tables” on schools, pupils and parents or the absurdity of attributing a “level” to each child. There is a statement that “a relatively poor school performance in

national mathematics tests may result in an increase in funding for extra apparatus for the teaching of mathematics, or, perhaps, in a review about the adequacy of the mathematics scheme used in the school”. While this may be true in some cases, there are other less attractive possible outcomes, including unhelpful publicity, and a general decline in the numbers of children at the school and attitude of the staff. On the contrary, we are told that “national testing should be viewed positively by teachers”. One of the dangers of the national tests in place in the UK is that unreasonable conclusions are drawn from the results. For example, we read that tests have shown that “many children are unable to express in writing their thinking and reasoning” and this contains an implied criticism of children and teachers . . . But do we know whether this related to the actual question that the children were asked, and the way in which it was presented? Have we even considered this an important aspect of learning mathematics? We are provided with a warning that “a mathematics test is only as good as the use to which teachers put children’s responses and the aggregated outcomes”. A serious omission is a warning that a test is only as good as the test itself: Is it valid? Does it ask the questions that we are interested in? Is it reliable? What about the important mathematical ideas that are not tested? What effect does it have on the users?

Generally, this book could very well offer a student teacher a useful resource, although it will not replace the value of a really good initial teacher course in which students can work together, discuss ideas, try out ideas with children, evaluate and discuss the outcomes with an experienced tutor. It competes, for example, with the book used by the Open University as a set text: *Lines of Development in Primary Mathematics*, by Mary Deboys and Eunice Pitt, published by Blackstaff Press, which is concerned just with providing ideas for teaching the content of mathematics at Key Stages 1 and 2. Another recent book well worth considering is *Children Learning Mathematics: Patterns and Relationships*, by Leone Burton, published by Simon & Schuster Education. Aimed at primary teachers, it contains many examples of children’s work and many contributions from practising teachers and would certainly give student teachers much to think about.

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